

We claim:

5 1. A multi-layer, thermoplastic stretch wrap film containing seven polymeric layers, comprising:

(a) two outer layers, at least one of which having a cling performance of at least 100 grams/inch, said outer layer being selected from the group consisting of linear low density polyethylene, very low density polyethylene, and ultra low density polyethylene resins, said resins being homopolymers, copolymers, or terpolymers, of ethylene and alpha-olefins; and

10 (b) five inner layers, with each layer being selected from the group consisting of linear low density polyethylene, very low density polyethylene, ultra low density polyethylene, and metallocene-catalyzed linear low density polyethylene resins, said resins being homopolymers, copolymers, or terpolymers, of ethylene and alpha-olefins.

15 2. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein said alpha olefins are propylene, 1-butene, 1-pentene, 1-hexene, 4-methyl-1-pentene, or 1-octene and range from C₃ to C₂₀.

20 3. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein no cling additives are present in said stretch wrap film.

54-19009-101399
54-19009-101399
4. The multi-layer, thermoplastic stretch wrap film of claim 2,
wherein said alpha-olefins range from C₃ to C₈.

5. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein said copolymers has an alpha-olefin weight percentage of 4 to 15% by
weight.

6. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein, wherein the resin melt index for each outer layer is 0.2 to 10 dg/min.

7. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein, wherein the resin melt index for each inner layer is 0.5 to 10 dg/min.

8. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein the resin density for each layer is about 0.860 to 0.940.

9. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein the hexane extractable level is below 3.5 weight percent.

20
Sub A3
10. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein the outer layers are 5 to 7 weight percent of the total film weight.

100

11. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein at least one said inner layer comprises low density polyethylene
homopolymers, wherein said low density polyethylene homopolymers have a
5 melt index of between about 0.2 to 10 dg/min; and a resin density of between
about 0.86 to 0.94 g/cc.

sub 24-
AH

12. The multi-layer, thermoplastic stretch wrap film of claim 1, which
further comprises one outer layer with substantially no inherent cling
10 characteristics.

120

13. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein the cling force at 0% elongation is about 100 grams to 300 grams as
measured according to ASTM D5458.

130

14. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein the transverse directional tear resistance is at least about 400 to 700
g/mil as determined by ASTM D1922 and a MD Elmendorf tear resistance of
at least about 50 g/mil to 350 g/mil.

SEE P. 50051469

5045
15. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein said outer layers have a thickness of 5 to 7% each of the total
thickness of the film, and

said five inner layers have a thickness of 5 to 28% each of the total
5 thickness of the film.

16. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein said seven polymeric layers are represented by the following formula:
A/C/B/C/D/C/E, wherein the relative composition of the layers is
10/20/10/20/10/20/10, % thickness and/or parts by weight, respectively,
with A and E representing a linear low density polyethylene hexene-copolymer,
B and D representing a metallocene catalyzed linear low density polyethylene
copolymer, and C represents a linear low density polyethylene hexene-
copolymer.

17. The multi-layer, thermoplastic stretch wrap film of claim 16,
wherein layers A and E have a melt index of 3.2 dg/min and a density of 0.917
g/cc; layers B and D have a melt index of 2.5 dg/min and a density of 0.917
g/cc; and layer C has a melt index of 2.0 dg/min and a density of 0.917 g/cc.

500
7/25

18. The multi-layer, thermoplastic stretch wrap film of claim 1,

wherein said stretch wrap film has a MD tensile elongation (%) of 400 to 700, a TD tensile elongation (%) of 600 to 900, a MD Elmendorf tear (g/mil) of 200 to 400, a TD Elmendorf tear (g/mil) of 450 to 700, and a dart impact (g) of from 100 to 300.

19. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein said seven polymeric layers are represented by the following formula: A/C/B/C/D/C/E, wherein

A represents :

a C₂/C₄/C₆ very low density polyethylene terpolymer with a melt index of 2.5 dg/min and a resin density of 0.910 g/cc, with a thickness of 2% of the total thickness of said stretch wrap film, or

a C₂/C₆ linear low density polyethylene copolymer blended with a C₂/C₃ copolymer to form a polymer with a melt index of 2.5 dg/min and a resin density of 0.915, with a thickness of 5% of the total thickness of the stretch wrap film;

B and D represent:

a C₂/C₆ metallocene catalyzed copolymer resin with a melt index of 1 or

2.5 dg/mm and a resin density of 0.910 g/cc and a melt flow ratio of 16-20

g/10 min; wherein D and D have a thickness of 7 to 10% of the total thickness of the stretch wrap film;

C represents :

a C₂/C₆ linear low density polyethylene copolymer with a melt index of 2 dg/mm and a resin density of 0.917 g/cc, or

a C₂/C₆ linear low density polyethylene copolymer with a melt index of 2 dg/mm and a resin density of 0.917 g/cc blended with a low density polyethylene homopolymer with a melt index of 0.2 to 2 dg/mm at a ratio of 95:5 to 75:25; wherein C has a thickness of 60 to 81% of the total thickness of the stretch wrap film; and

E represents:

a C₂/C₄ linear low density polyethylene copolymer with a melt index of 2 dg/mm, or

a C₂/C₆ linear low density polyethylene copolymer with a melt index of 3 dg/mm and a resin density of 0.917 g/cc, wherein E has a thickness of 5 to 10% of the thickness of the stretch wrap film.

20. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein said seven polymeric layers are represented by the following formula:

A/C/B/C/D/C/E, wherein

A represents:

sub
75

a C₂/C₄/C₆ very low density polyethylene terpolymer with a melt index of 2.5 dg/min and a resin density of 0.910 g/cc, with a thickness of 2% of the total thickness of said stretch wrap film, or

5 a C₂/C₆ linear low density polyethylene copolymer blended with a C₂/C₃ copolymer to form a polymer with a melt index of 2.5 dg/min and a resin density of 0.915 , with a thickness of 5% of the total thickness of the stretch wrap film;

B and D represent:

60 a C₂/C₆ metallocene catalyzed copolymer resin with a melt index of 1 dg/mm and a resin density of 0.917 g/cc and a melt flow ratio of 16-20 g/10 min; wherein B and D have a thickness of 7 to 10% of the total thickness of the stretch wrap film;

C represents:

65 a blend of a C₂/C₆ linear low density polyethylene copolymer with a melt index of 1 dg/mm and a low density polyethylene with a melt index of 2 dg/mm in a ratio of 95:5 to 75:25; wherein C has a thickness of 60 to 81% of the total thickness of the stretch wrap film; and

E represents:

20 a C₂/C₄ linear low density polyethylene copolymer with a melt index of 2 dg/mm, or

5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150
155
160
165
170
175
180
185
190
195
200
205
210
215
220
225
230
235
240
245
250
255
260
265
270
275
280
285
290
295
300
305
310
315
320
325
330
335
340
345
350
355
360
365
370
375
380
385
390
395
400
405
410
415
420
425
430
435
440
445
450
455
460
465
470
475
480
485
490
495
500
505
510
515
520
525
530
535
540
545
550
555
560
565
570
575
580
585
590
595
600
605
610
615
620
625
630
635
640
645
650
655
660
665
670
675
680
685
690
695
700
705
710
715
720
725
730
735
740
745
750
755
760
765
770
775
780
785
790
795
800
805
810
815
820
825
830
835
840
845
850
855
860
865
870
875
880
885
890
895
900
905
910
915
920
925
930
935
940
945
950
955
960
965
970
975
980
985
990
995

sub
AS

a C₂/C₆ linear low density polyethylene copolymer with a melt index of 3 dg/mm and a resin density of 0.917 g/cc, wherein E has a thickness of 5 to 10% of the thickness of the stretch wrap film.

5 21. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein said seven polymeric layers are represented by the following formula: A/C/B/C/D/C/E, wherein

A and E represent:

10 a C₂/C₄ linear low density polyethylene copolymer with a melt index of 2 dg/min and a resin density of 0.910 g/cc, with a thickness of 5 to 10% each of the total thickness of said stretch wrap film,

B and D represent:

15 a C₂/C₆ linear low density polyethylene copolymer resin with a melt index of 2 dg/mm and a resin density of 0.910 g/cc, with a thickness of 7 to 10% of the total thickness of the stretch wrap film; and

C represents:

20 a blend of a C₂/C₄ linear low density polyethylene copolymer with a melt index of 2 dg/mm and a density of 0.910 g/cc, with a thickness of 60 to 81% each of the total thickness.

22. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein at least one of said five inner layers comprise metallocene catalyzed

5 sub
As amended
polyethylene with a melt index of 0.5 to 5 dg/min and a melt flow ratio of 30 to 50 g/10 min, wherein said at least one of said five inner layers comprise 5 to 80 weight percent of the total film composition.

5 22²
23. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein the dart impact as measured by the F-50 dart drop test procedure is at least 75 to 200 g/mil.

10 24. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein the melt flow index is between 0.2 and 10.

15 25. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein at least one layer contains blends of at least two of said resins.

20 26. The multi-layer, thermoplastic stretch wrap film of claim 1, wherein said seven polymeric layers are represented by the following formula: A/C/B/C/D/C/E, wherein the relative composition of the layers is 7/24/7/24/7/24/7, % thickness and/or parts by weight, respectively, with A and E representing a linear low density polyethylene hexene-copolymer, B and D representing a metallocene catalyzed linear low density polyethylene

5412
copolymer, and C represents a linear low density polyethylene hexene-
copolymer.

27. The multi-layer, thermoplastic stretch wrap film of claim 1,
5 wherein the resin density for each layer is about 0.880 to 0.930.

28. The multi-layer, thermoplastic stretch wrap film of claim 1,
wherein the resin density for each layer is about 0.900 to 0.925.

5412
29. A multi-layer, thermoplastic stretch wrap film containing seven
10 polymeric layers, comprising:

(a) two outer layers, at least one of which having a cling performance of
at least 100 grams/inch, said outer layer being selected from the group
consisting of linear low density polyethylene, very low density polyethylene, and
15 ultra low density polyethylene resins, said resins being homopolymers,
copolymers, or terpolymers, of ethylene and alpha-olefins; and

(b) five inner layers, with each layer being selected from the group
consisting of linear low density polyethylene, very low density polyethylene,
ultra low density polyethylene, and metallocene-catalyzed linear low density
20 polyethylene resins, said resins being homopolymers, copolymers, or
terpolymers, of ethylene and alpha-olefins,

sub
A6amid

wherein at least one of said inner layers comprises a metallocene catalyzed linear low density polyethylene resin with a melt index of 0.5 to 3 dg/min and a melt index ratio of 16 to 80.

5

0443009-101399
SECRET